Proarticulata

Proarticulata is a proposed phylum of extinct, bilaterally symmetrical animals known from fossils found in the Ediacaran (Vendian) marine deposits, and dates to approximately 567 to 550 million years ago.[1][2] The name comes from the Greek προ (*pro-*) = "before" and Articulata, i.e. prior to animals with true segmentation such as annelids and arthropods. This phylum was established by Mikhail A. Fedonkin in 1985 for such animals as *Dickinsonia*, *Vendia*, *Cephalonega*, *Praecambridium*[3] and currently many other Proarticulata are described (see list).[4][5]

Due to their simplistic morphology, their affinities and mode of life are subject to debate. They are almost universally considered to be metazoans, and due to possessing a clear central axis have been suggested to be stem-bilaterians. In the traditional interpretation, the Proarticulartan body is divided into transverse articulation (division) into **isomers** as distinct from the transverse articulation **segments** in annelids and arthropods, as their individual isomers occupy only half the width of their bodies, and are organized in an alternating pattern along the longitudinal axis of their bodies.[5] In other words, one side is not the direct mirror image of its opposite (*chirality*). Opposite isomers of left and right side are located with displacement of half of their width. This phenomenon is described as the symmetry of gliding reflection.[6][7] Some recent research suggests that some proarticulatans like *Dickinsonia* have genuine segments, and the isomerism is superficial and due to taphonomic distortion.[8] However, other researchers dispute this.[9][10] Displacement of left-right axis is known in bilaterians, notably lancelets.[11][12]

Contents

Morphology
- Vendiamorpha
- Cephalozoa
- Dipleurozoa
- Proarticulata *Incertae sedis*

List of Proarticulata
- Body fossils
- Trace fossils

See also

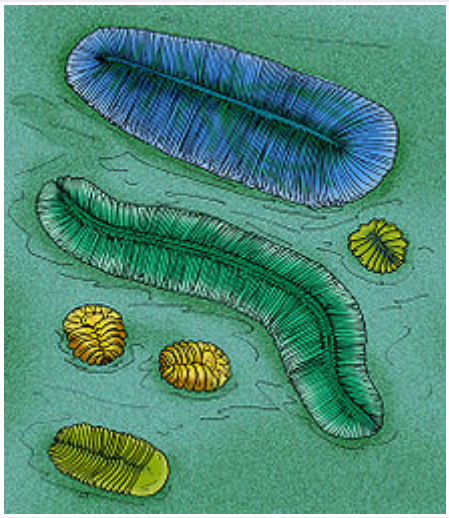
References

External links

Proarticulata

Temporal range: Late Ediacaran, between 567–550 Ma

Pre€ € O S D C P T J K PgN



Several proarticulates

Scientific classification

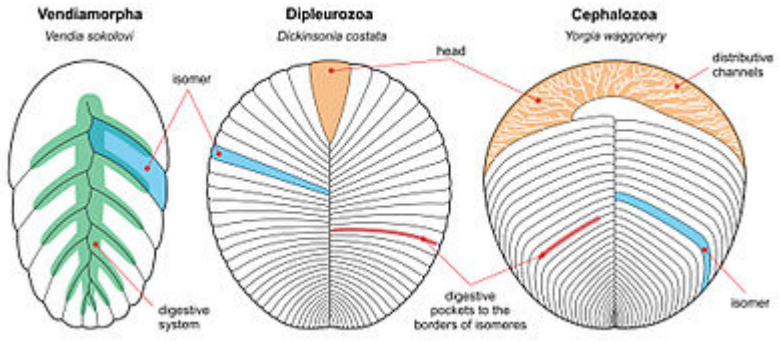
Kingdom:	Animalia
Clade:	Bilateria
Phylum:	†Proarticulata Fedonkin, 1985

Class / Family

- †Vendiamorpha Fedonkin, 1985
  - †Vendiidae Ivantsov
- †Dipleurozoa Harrington & Moore, 1955
  - †Dickinsoniidae Harrington & Moore, 1955
- †Cephalozoa Ivantsov. 2004
  - †Sprigginidae Glaessner, 1958

Morphology

- †Yorgiidae Ivantsov, 2001



Examples of the classes Proarticulata, including reconstructions of *Vendia sokolovi*, *Dickinsonia costata* and *Yorgia waggoneri*.

Vendiamorpha

The body is completely segmented, with all isomers curved towards the posterior, and the first isomer is normally much larger than the rest. The first two isomers at the anterior dorsal end are partly fused. (e.g., *Vendia*, *Paravendia* and *Karakhtia*).[6][13][14][15]

Cephalozoa

These proarticulatans are incompletely segmented, as the anterior zone is free of isomers, often making a "hairband" like appearance. (example cephalozoans include *Yorgia*, *Praecambridium*, *Andiva*, *Archaeaspinus*, *Ivovicia*, *Spriggina*, *Marywadea* and *Cyanorus*.)[6][13][15][16] Some cephalozoans from the family Yorgiidae demonstrate pronounced asymmetry of left and right parts of the body. For instance, *Yorgia*'s initial right isomer is the only one which spreads far towards the left side of the body. *Archaeaspinus* has an unpaired anterior lobe confined by the furrow to the left side only.[6][7][15]

Dipleurozoa

The dipleurozoan body is subradial, divided by isomers entirely (e.g., *Dickinsonia* and *Phyllozoon*). *Dickinsonia* juveniles show undivided anterior areas but these regions were reduced in the course of ontogeny, and in the adult stages *Dickinsonia*-like proarticulates changed so radically that they became almost indistinguishable from isomers.[13][16][17]

Proarticulata *Incertae sedis*

In *Cephalonega stepanovi* and *Tamga hamulifera* all isomers are encircled by a peripheral undivided zone.[16] In the former, the isomers remain in contact with each other, forming a raft-like region, while in the latter, the isomers are isolated from each other and do not touch. In *Lossinia*, the center undivided region has no visible isomers, instead having the lobe-like isomers emanate from the periphery of the undivided region as "transverse articulations."[16]

List of Proarticulata

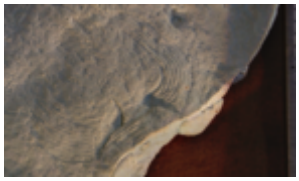
Body fossils

Andiva ivantsovi

- *Armillifera* Fedonkin, 1980[18]
  - *A. parva* Fedonkin, 1980
- *Andiva* Fedonkin, 2002[19]
  - *A. ivantsovi* Fedonkin, 2002
- *Archaeaspinus* Ivantsov, 2007[6] (=*Archaeaspis* Ivantsov, 2001)[16]
  - *A. fedonkini* Ivantsov, 2001
- *Cephalonega* Ivantsov *et al.*, 2019[20]
  - *C. stepanovi* (Fedonkin, 1976)[16][21]
- *Chondroplon* Wade, 1971 (possible =*Dickinsonia*)
  - *C. bilobatum* Wade, 1971
- *Cyanorus* Ivantsov, 2004[13]
  - *C. singularis* Ivantsov, 2004
- *Dickinsonia* Sprigg, 1947
  - *D. costata* Sprigg, 1947
  - *D. lissa* Wade, 1972
  - *D. menneri* Keller 1976[16] (=*Vendomia menneri* Keller 1976[21])
  - *D. tenuis* Glaessner et Wade, 1966
- *Ivovicia* Ivantsov, 2007[16]
  - *I. rugulosa* Ivantsov, 2007
- *Karakhtia* Ivantsov, 2004
  - *K. nessovi* Ivantsov, 2004
- *Lossinia* Ivantsov, 2007[16]
  - *L. lissetskii* Ivantsov, 2007
- *Marywadea* Glaessner, 1976
  - *M. ovata* Glaessner et Wade, 1966
- *Ovatoscutum* Glaessner et Wade, 1966
  - *O. concentricum* Glaessner et Wade, 1966
- *Paravendia* Ivantsov, 2004[6][13]

Dickinsonia costata

Spriggina floundersi



Ovatoscutum concentricum

Yorgia waggoneri

P. janae Ivantsov, 2001 (=*Vendia janae* Ivantsov, 2001)

- *Phyllozoon* Jenkins et Gehling, 1978

  P. hanseni Jenkins et Gehling, 1978

- *Podolimirus* Fedonkin, 1983

  P. mirus Fedonkin, 1983

- *Praecambridium* Glaessner et Wade, 1966

  P. siggilum Glaessner et Wade, 1966

- *Spriggina* Glaessner, 1958

  S. floundersi Glaessner, 1958

- *Tamga* Ivantsov, 2007[16]

  T. hamulifera Ivantsov, 2007

- *Valdainia* Fedonkin, 1983

  V. plumosa Fedonkin, 1983

- *Vendia* Keller, 1969[6][13]

  V. sokolovi Keller, 1969
  V. rachiata Ivantsov, 2004

- ? *Windermeria* Narbonne, 1994

  W. aitkeni Narbonne, 1994[22]

- *Yorgia* Ivantsov, 1999[7]

  Y. waggoneri Ivantsov, 1999

Trace fossils

- *Epibaion* Ivantsov, 2002[17][23]

  E. axiferus Ivantsov, 2002.
  E. waggoneris Ivantsov, 2011. This is a trace of *Yorgia waggoneri*
  E. costatus Ivantsov, 2011. This is a trace of *Dickinsonia costata*

See also

- List of Ediacaran genera

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External links

- Database of Ediacaran Biota (https://web.archive.org/web/20110725191154/http://www.complex-life.org/database) Advent of Complex Life

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